

A1 The way we are

Learn about:

● Inheritance



Why do we look like our parents?

If you look at the members of a family you will see that although they are all different, they have many similarities. This is because some of the same features from their parents and grandparents have been inherited or passed on to them. A baby inherits some features from its mother and some from its father. The information about these features is carried inside the nucleus of the sperm and the egg. One successful sperm fertilises the egg. The sperm nucleus and egg nucleus fuse during fertilisation to form the first cell of the new baby.

The nucleus of both the sperm and the egg contain genes. **Genes** are instructions that control the way our features develop. There are genes to control many different features. Each baby inherits half its genes from its mother and half from its father.

Every sperm and every egg contains a different set of genes. When a sperm and egg fuse to form a fetus, there is a completely new combination of genes. That is why the children of two parents are not the same, except for identical twins, although they may have many similarities. Each baby is unique: it resembles its parents in some ways, but is not exactly like either of them.

- a** Why do you think a baby does not look half like its father and half like its mother?



The nucleus of the cell contains thousands of genes.

Only humans?

Features are inherited in other species too. Look at the photos on the right.

- b** (i) Describe one feature that has been inherited by the rats.
(ii) Describe one feature that has been inherited by the pea plants.

In plants, the nucleus of the pollen grain and the nucleus of the egg cell fuse during fertilisation. The fertilised egg cell will grow into a new plant and its features will be controlled by the genes inside the pollen grain and the egg cell.



Twins

In humans, when a sperm fertilises an egg, the fertilised egg may split into two embryos. Identical twins are formed. Both twins have come from the same sperm and egg, so they have the same genes and the same features.

If there are two different eggs at the same time, and each is fertilised by a different sperm, the twins will have different genes and different features. They are non-identical twins.

- c** Can identical twins be of different sexes? Explain your answer.

Inherited variation

There are genes to control all of your features. Your genes control, for example, whether you will have:

- curly or straight hair
- blue or brown eyes.

Some of these features controlled by your genes are either one thing or another – there is no 'in-between'. Look at bar chart A. For example, some people have ear lobes that are attached to the side of their face, and other people have unattached ear lobes. Which type have you got?

Other features show a range. Look at bar chart B. For example, for height there is a range from very short to very tall with lots of heights in between. If a baby inherits genes for tallness from both parents, it will probably grow up to be tall. If it inherits genes for tallness and genes for shortness, we can't be sure what effect these genes will have on the person's height.

Environmental variation

Identical twins have exactly the same genes, but they sometimes look different when they grow older. Studying identical twins gives us a lot of information about how features are affected by the environment.

For example, a pair of identical twins may both inherit genes for tallness, but one may have a poorer diet than the other. The one with the healthier diet will grow taller. If one twin does not go to school, he or she may not reach the same level of intelligence as the twin who is educated.

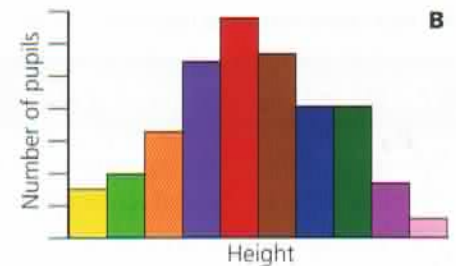
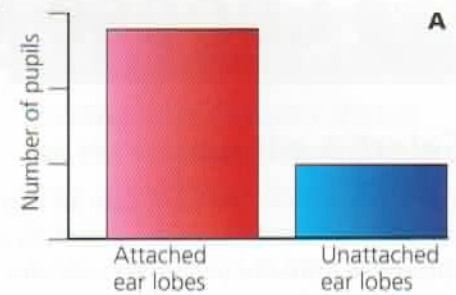
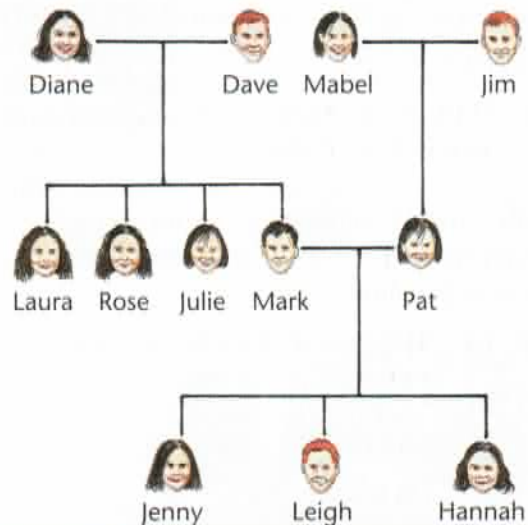
The environment can affect plants too. Bonsai trees are miniature trees. They have the normal genes for tallness, but are small because they have been grown in small pots.

All these examples show how genes and the environment can cause variation in features. This means some features are a result of both inherited variation and environmental variation.

Family trees

The diagram on the right shows the family tree for the Foster family. The children inherit their hair colour from their parents.

- Examine the family tree. From which people has Leigh inherited genes for red hair?
- Laura and Rose are identical twins. Why have they both got dark hair?
- Suggest two other features that will be the same for Laura and Rose.
- Laura weighs 65 kg and Rose weighs 50 kg. Suggest why their weights are not identical.



Questions

- Explain how we inherit our features from our parents.
- Where in the cell are the genes?
- Here is a description of a Year 9 girl: 'blue eyes, not very tall, olive skin, red hair, intelligent, attached ear lobes'. Which of these features may have been affected by her environment?
- Draw diagrams to explain how identical twins and non-identical twins are formed.
- Scientists often study identical and non-identical twins as they grow up. Suggest some of the ideas they might investigate.
- Two seeds from the same apple were planted in different areas. One tree had large apples, and the other tree had small apples. Describe two factors that might have caused this variation.

For your notes:

- An organism inherits features from both its parents. These features are controlled by **genes**.
- Identical twins have the same genes because they come from the same sperm and egg.
- Non-identical twins are formed when two sperm fertilise two eggs.
- Both inheritance and the environment cause variation between the members of a species.